

TOTAL PETROLEUM HYDROCARBONS (TPH) AND LIGHT NON-AQUEOUS PHASE LIQUID (LNAPL) CHARACTERIZATION, REMEDICATION AND MANAGEMENT



Our Mission: To protect and improve the health and environment of all Kansans.

TPH AND LNAPL BER POLICY # BER-041

Agenda

- × Policy Overview
- × Tier 2 Screening Levels
- × Risk Evaluation and Assessment
- × LNAPL
- × Q&A

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- ✘ Established Stakeholder Work Group
- ✘ Kick Off Meeting in January 2015
 - + Soil to GW # too low, difficult to obtain
 - + Flexibility (e.g., compositional analysis)
 - + Carve out Higher End Products
 - + Address LNAPL

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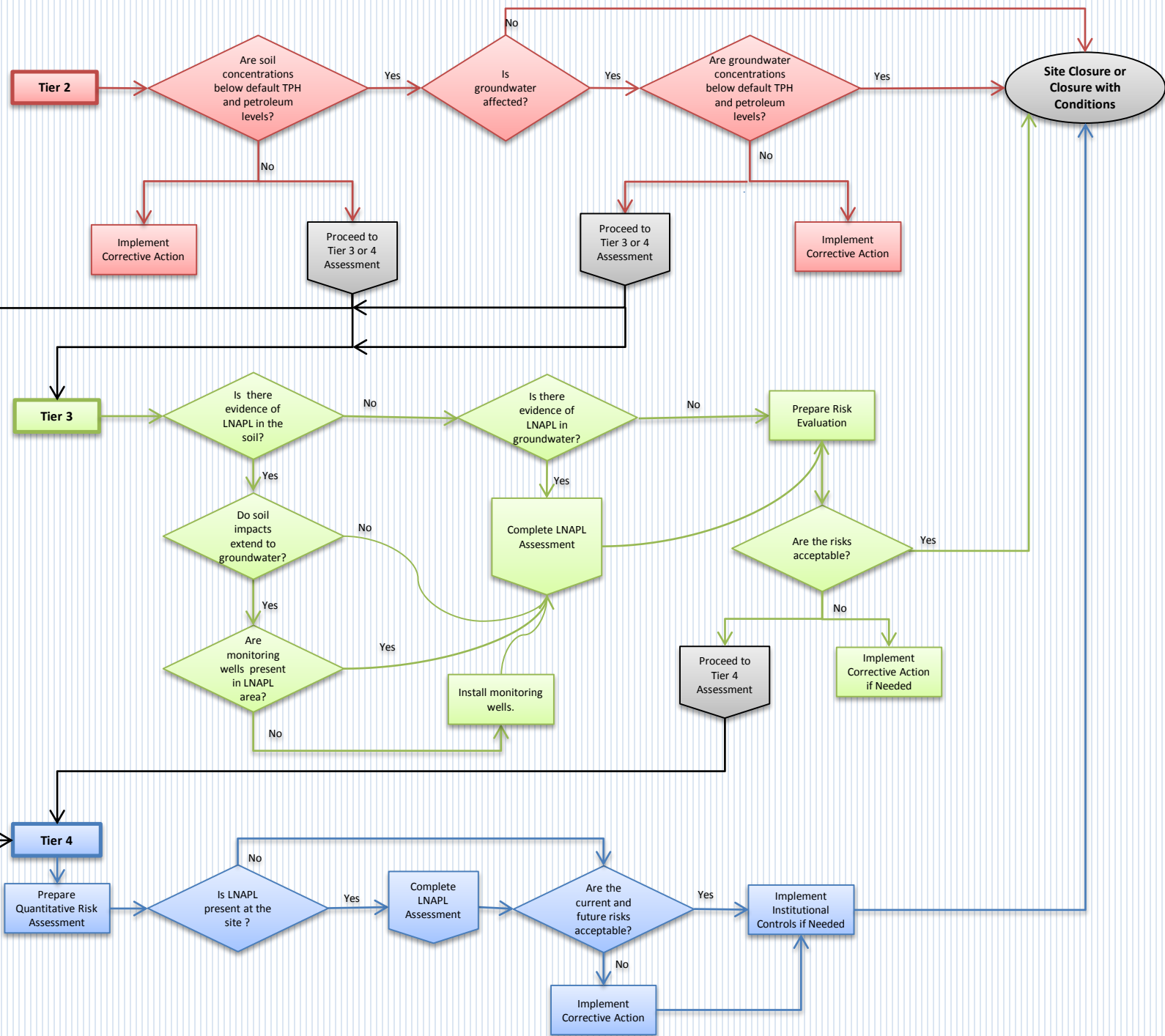
- ✘ DRO range was too large – unfair to sites with less toxic, high-carbon contaminants
- ✘ Old TPH Tier 2 values were outdated
 - + Updates in contaminant toxicity information
 - + Updates in contaminant chemical parameters

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- ✖ Not as Simple as Gasoline, Diesel, and Oil
- ✖ Petroleum consists of a complex mixture of compounds.



- + originally in crude oil → refined to various products → characterized by carbon number
- + Mixture varies by product and age
- + Analytical methods produced varied and overlapping results
- + Impractical to characterize and evaluate risk for every individual chemical in the mixture



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✖ Significant Changes

| Current | Previous |
|--|---|
| Low-Range Hydrocarbons (LRH) ≥C5 - <C9 | Gasoline Range Organics (GRO) C5 – C10 |
| Mid-Range Hydrocarbons (MRH) ≥C9 - <C19 | Diesel Range Organics (DRO) C10 – C35 |
| High-Range Hydrocarbons (HRH) ≥C19 - ≤C35 | |

- ✖ Residual LNAPL – immobile, non-recoverable LNAPL in the fractures or pore space of bedrock or soil.

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Development of Screening Levels

- ✖ RSK Manual equations
- ✖ Exposure factors from EPA, 2014
- ✖ Chemical-specific parameters (HLC, koc, etc.) from EPA RSL tables
- ✖ Toxicity values (non-carcinogenic only) from EPA PPRTV (2009), MADEP (2004), EPA RSL tables, and route-to-route extrapolation

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Development of Screening Levels Cont.

- ✖ Calculated media screening values for the aliphatic and aromatic fractions for each hydrocarbon range
- ✖ Combined fraction screening values for final range value
 - + LRH – 100% aliphatic
 - + MRH – 60% aliphatic, 40% aromatic
 - + HRH – 70% aliphatic, 30% aromatic

TIER 2 SCREENING LEVELS

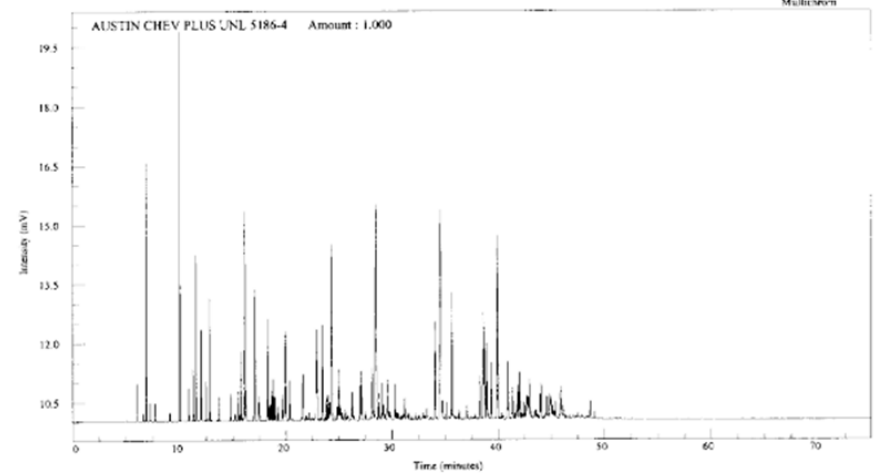
| | <u>SOIL</u> | | <u>GW</u> | | <u>Soil to</u> | <u>GW</u> |
|-----------------------------|---------------|----------------|-------------|----------------|------------------|---------------|
| | Residential | Non-Res | Residential | Non-Res | Residential | Non-Res |
| | (mg/kg) | (mg/kg) | (ug/L) | (ug/L) | (mg/kg) | (mg/kg) |
| LRH (≥C5 - <C9) | 550 | 950 | 350 | 950 | 50 | 150 |
| TPH(GRO) | 220 | 450 | 500 | 500 | 79.3 | 79.3 |
| MRH (≥C9 - <C19) | 250 | 350 | 150 | 400 | 50 | 150 |
| | 96/110 | 440/600 | | 100/5.5 | 1.5/0.023 | |
| TPH(DRO) | 2000 | 20,000 | 500 | 720 | 5440 | 7830 |
| HRH (≥C19 - ≤C35) | 6000 | 27,000 | 1000 | 2500 | 6000 | 12,900 |

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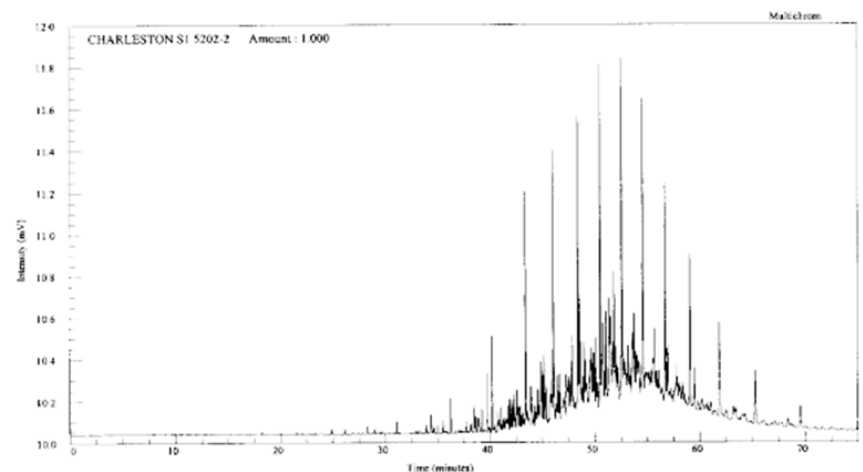
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- ✗ Different petroleum products have different analytical “fingerprints”
- ✗ Peak patterns fall within a particular window, total petroleum hydrocarbon reported as that range

Gasoline



Diesel #2



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Risk Evaluation and Risk Assessment

- ✖ Replace default parameters with site-specific
- ✖ Eliminate Pathways
 - + Consideration of current/known future uses (i.e. paved parking lot – eliminate inhalation)
 - + Assume non-residential use, land use restrictions (EUCs)
- ✖ Composition and Forensics Analysis
- ✖ What is really driving risk?

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- ✘ Is LNAPL Present?
- ✘ KDHE Assumes YES
 - + Historical evidence – boring logs, field notes, spill report, etc.
 - + Observed in a well
- ✘ Further evaluation required
(Does not mean LNAPL should be addressed.)



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www.kdheks.gov/ber/policies.html

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